Wilson Bulletin 117(1):56–62, 2005

APPARENT PREDATION BY CATTLE AT GRASSLAND BIRD NESTS

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ABSTRACT.—We document the first cases of cattle behaving as avian predators, removing nestlings and eggs from three active ground nests in continuously grazed pastures in southwestern Wisconsin, 2000–2001. Cows removed three of four Savannah Sparrow (*Passerculus sandwichensis*) eggs from one nest (the fourth egg was damaged), all four Eastern Meadowlark (*Sturnella magna*) nestlings from another, and all three Savannah Sparrow nestlings from a third. We found only two of three missing eggs (intact) and one of seven missing nestlings (dead) near two of the nests. Cows may have eaten the egg and nestlings we were unable to account for; alternatively, the egg and nestlings may have been scavenged by predators or removed from the area by the adult birds. Without videotape documentation, we would have attributed nest failure to traditional predators and cattle would not have been implicated. We may be underestimating the impact of cattle on ground nests by not considering cattle as potential predators. *Received 10 May 2004, accepted 6 December 2004.*

Over the last 30 years, grassland birds have declined more rapidly and consistently than any other avian guild in the Midwest (Vickery and Herkert 2001). One possible cause is the loss and fragmentation of native and secondary grasslands (Sample et al. 2003). Herkert et al. (1996) found a significant correlation between the decline of grassland birds in the Midwest and the conversion of hay and pasture acreage to row crops and other unsuitable habitat. Since the conversion of land from native prairie to agriculture during European settlement, secondary grasslands, such as pastureland, have become critical components of grassland passerine conservation (Herkert 1991, Herkert et al. 1996, Sample and Mossman 1997).

Nest predation is a major factor in the nesting failure of most passerine species (Lack 1968, Ricklefs 1969, Martin 1988). This may be a particular problem in grassland ecosystems where generalist predators, such as raccoons (*Procyon lotor*) and skunks (*Mephitis* spp.), have responded positively to human disturbance and landscape fragmentation (Sargeant et al. 1993, Warner 1994). In actively grazed pastures, ground-nesting grassland birds face additional risks from cattle. In southwestern Wisconsin, Temple et al. (1999) thought that many of the nest losses incurred by grassland birds in grazed pastures were a result of cattle trampling and nest desertion after cattle had grazed down the vegetation surrounding the nest.

In previous literature on cattle disturbance to bird nests, authors have used sign to interpret the occurrence of cattle disturbance, mainly at artificial nests and under rotational grazing regimes (Paine et al. 1996, 1997). Under a rotational grazing regime at the University of Wisconsin's Lancaster Agricultural Research Station in southwestern Wisconsin, Paine et al. (1996) documented cattle disturbance resulting in nest failure at simulated ground nests in which Ring-necked Pheasant (*Phasianus colchicus*) eggs had been placed. Ninety-four percent of failed nests were the result of cattle damage. Nest disturbance included nest contents being trampled, kicked out, crushed by the animal's muzzle, or covered with a manure pile. The mean percentage of nests ($n = 15$) having ≥ 1 egg trampled by a bovine hoof was 63% for the 1-day treatment, 52% for the 4-day treatment, and 41% for the 7-day treatment.

In a refinement of their 1996 study, Paine et al. (1997) documented cattle sniffing, licking, and occasionally picking up contents of simulated ground nests (clay pigeon targets and pheasant eggs). Their study was not designed to represent natural conditions, but rather to assess intentional and inadvertent nest disturbances. Overall trampling levels for clay pigeon targets and pheasant eggs were 35 and 36%, respectively. Cattle intentionally disturbed 25% of clay targets and 8% of egg

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nests. In a few instances, cattle picked up single eggs with their mouths and carried them "several feet" without damaging them.

Whereas several studies have evaluated cattle trampling and/or disturbance at artificial ground nests in rotationally grazed pastures (Koerth et al. 1983; Jensen et al. 1990; Paine et al. 1996, 1997), few studies have documented cattle disturbances to nests in continuously grazed systems under conditions occurring in the Midwest.

Cattle have not previously been documented deliberately removing eggs and young from active passerine nests. Other herbivores that have been documented eating or removing eggs and/or young include white-tailed deer (*Odocoileus virginianus*; Pietz and Granfors 2000) and caribou (*Rangifer tarandus*; Abraham et al. 1977) in North America, and sheep (*Ovis*) and red deer (*Cervus elaphus*) in the British Isles (Furness 1988a, 1988b; Pennington 1992). Our study is unique in providing direct documentation of cattle effects on real nests of grassland passerines under a continuous grazing regime.

METHODS

We searched for ground-nesting grassland bird nests in continuously grazed pastures in 2000 (n = 10) and 2001 (n = 9) in southwestern Wisconsin (Nack 2002). Stocking rates in pastures (May–August) ranged from 0.61 to 4.28 animal units (AU)/ha (mean = 2.09, SE = 0.37, n = 10) and from 0.75 to 4.33 AU/ha (mean = 2.19, SE = 0.34, n = 9) in 2000 and 2001, respectively.

To capture video footage of nest predators, we used methods and camera equipment similar to those used by Renfrew and Ribic (2003). Sentinel™ all-weather miniature video camera surveillance systems (Sandpiper Technologies, Manteca, California) were deployed at nests between 15 May and 31 July 2000–2001. In a pilot study during 2000, cameras were placed in a single pasture at 13 of 198 nests. In 2001, cameras were set up in six pastures (including the pasture used in 2000) at 41 of 196 nests. In total, we monitored 54 ground nests with cameras: 34 Savannah Sparrow (*Passerculus sandwichensis*), 12 meadowlark (*Sturnella magna* and *S. neglecta*), 4 Bobolink (*Dolichonyx oryzivorus*), 3 Grasshopper Sparrow (*Ammodramus savannarum*), and 1 Upland Sandpiper (*Bartramia longicauda*).

Cameras were mounted 5–30 cm above ground on a wooden dowel and placed approximately 12–25 cm from nests. Cameras were concealed in surrounding vegetation in an attempt to avoid detection by predators. Because vegetation height in the pastures was relatively short and birds preferred to nest in small clumps of grass, we were forced to place cameras closer to nests than we would have liked. Each camera's field of view included the nest and a small area surrounding the nest.

Each camera was 4 × 4 × 4 cm (64 cm^3) in size and had infrared light-emitting diodes (LEDs) mounted around the lens to provide illumination at night. The camera was connected by a 25-m cable to a 24-hr, time-lapse videocassette recorder (VCR) and a deep-cycle marine battery. The cable was buried just underneath the sod layer to protect it from cattle and rodents. The VCR was enclosed in a waterproof case, and the battery and case were covered with a pyramid made from metal hog-fencing panels. The pyramid was then staked into the ground to prevent cattle disturbance and covered with a piece of green canvas to shade the VCR and prevent it from overheating. Nests were checked remotely each day by using a monitor at the VCR to view the nest without having to disturb the nesting birds. The battery powering the VCR was changed every other day and the tape was changed daily. The VCR recorded 4 frames/sec; thus, a standard VHS tape would last for a 24-hr period.

Videotapes were reviewed to determine nest fates and identify predators. We considered a nest successful if one nestling fledged. We used head size, shape, and position to identify images as cattle. We refer to the cattle as cows (pastures were stocked with cows, cow/calf pairs, and one bull).

We categorized nest failure attributed to cattle as either apparent nest predation or inadvertent disturbances (e.g., trampling, knocking the camera into the nest bowl and subsequently breaking eggs). We defined apparent nest predation as the deliberate removal of nest contents by cattle, but with the ultimate fate (i.e., consumption) unknown.

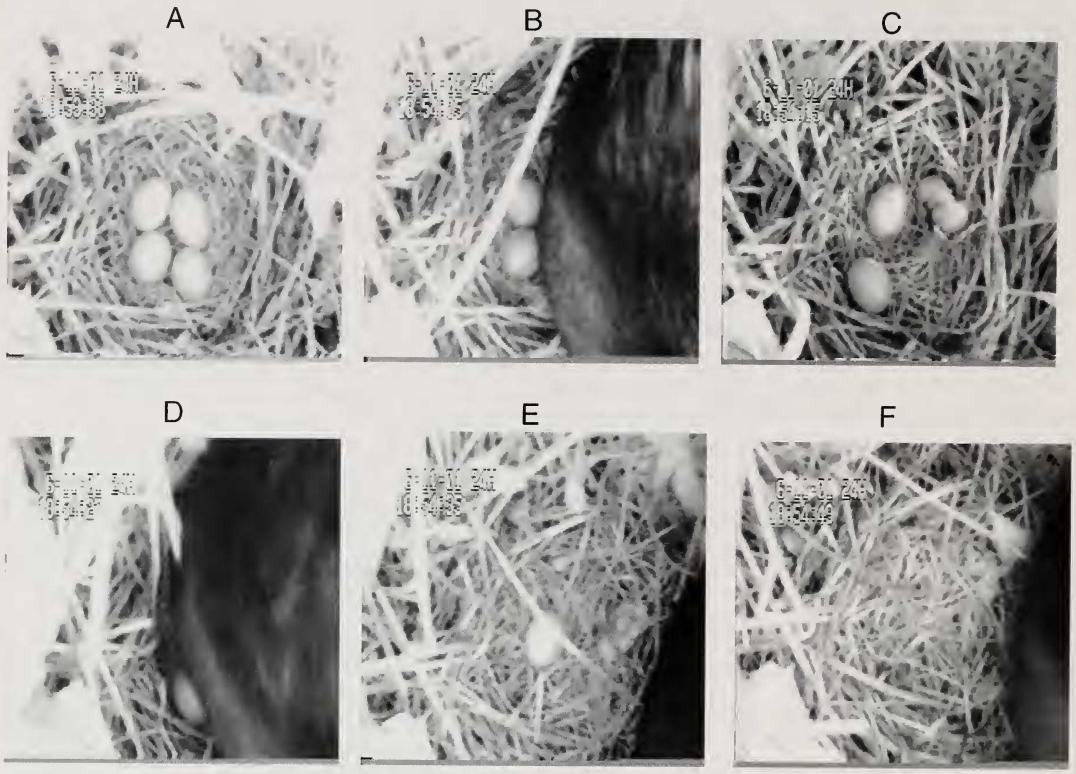

FIG. 1. Sequence of images documenting a cow removing three Savannah Sparrow eggs from an open-cup nest and crushing the fourth egg in a southwestern Wisconsin pasture, 11 June 2001.

RESULTS

Of the 54 nests monitored by cameras, 7 were abandoned after the camera was deployed, 12 were successful, 21 were depredated by "traditional" predators, and 14 failed due to cattle disturbance. Seven of the 14 (50%) cattle-caused nest failures were inadvertent disturbances; a cow lay down on one nest, one was abandoned, two were trampled, and the camera was knocked down at three nests, crushing the eggs. Apparent nest predation occurred at 3 of the 14 (21%) nests. At four others, we were unable to categorize the nest failure attributed to cattle. In three of these four cases, the camera was either knocked over or tipped by a cow, but there was no clear footage of events; some of the nest contents were missing but we could not be certain they were removed by the cow (they may have been removed by one of the adult birds). In the fourth case, grass was pushed up against the camera and it was unclear whether a cow killed the nestlings with its muzzle or trampled them. After the cow left, camera footage revealed that an adult bird returned and removed all five dead nestlings.

The following summarizes the three instances of apparent nest predation by cattle.

Event 1.—On 11 June 2001 at 18:53:27 CST, an adult Savannah Sparrow flushed from its open-cup nest containing four eggs (Fig. 1A, 18:53:38). The grass surrounding the nest began to move 9 sec later. At 18:54:02, a cow's muzzle was visible at the nest bowl, where it remained for 13 sec (Fig. 1B, 18:54:05). At 18:54:15, the cow moved its muzzle out of the nest and the videotape showed two intact eggs and one broken egg in the nest (Fig. 1C). At 18:54:21, the cow's muzzle was again visible at the nest bowl and remained there for 37 sec (Fig. 1D, 18:54:27), during which time the cow continued to remove eggs. At 18:54:35, there was a clear view of one intact egg and one broken egg (Fig. 1E). At 18:54:49, only a piece of the broken egg was in the nest bowl (Fig. 1F). The cow's muzzle

moved out of view at 18:54:58, but the cow continued to stay near the nest and returned to the empty nest bowl a few times, apparently licking the grass. At 18:56:46, the cow tipped the camera over and nuzzled it until 18:57:45, when the cow presumably left. In summary, the cow was at the nest bowl for at least 50 sec during two visits. After examining the nest bowl and surrounding area, we found two intact eggs approximately 20 cm from the nest and a piece of eggshell in the nest bowl. The nest bowl was slightly pulled apart.

Event 2.—On 23 May 2001 at 06:45:07, an adult Eastern Meadowlark left its domed nest after feeding four 5-day-old nestlings. At 07:00:27, grass movement was visible on the videotape and it was apparent that the camera was being nudged. At 07:03:25, a cow put its muzzle in the nest bowl, where it remained for 8 sec before moving out of camera view. At 07:03:33, only three nestlings remained. During the next 6 min, the cow stayed in the area of the nest, as evidenced by grass and camera movement. At 07:09:29, the cow returned and placed its muzzle in the nest bowl for 4 sec. At 07:09:33, there were only two nestlings in the nest (cow not visible in the frame). At 07:11:13, an adult meadowlark returned to the nest with a caterpillar, fed the remaining two nestlings, and sat on the nest. The nest was tended for the next 11 hr (07:09 to 18:07). We inspected the nest area at 14:00 and found no sign of the two missing nestlings; there were still two live nestlings in the nest.

An adult fed the nestlings at 18:07:46 and left at 18:12:16 with a fecal sac. The grass began to move at 18:18:17 and the camera was jostled. At 18:18:28, a cow placed its muzzle in the nest bowl, where it remained for 3 sec. The camera was then moved so that the nest was out of view, but the cow's dark muzzle could be detected occasionally through the vegetation until 18:18:53. In summary, a cow was at the nest for at least 15 sec during three visits. We inspected the nest area again on 24 May at 13:30, and found no young in the nest; however, 30 cm from the nest was a dead nestling that had no visible signs of injury. The edges of the nest bowl were flattened and the camera was turned slightly. In our study area, Eastern Meadowlarks typically fledge at 10 days, so it is unlikely that the missing nestlings survived.

Event 3.—On 7 July 2001 at 05:11:37, an adult Savannah Sparrow fed three 7-day-old nestlings in its open-cup nest. At 05:11:44, the adult left carrying a fecal sac. At 05:15:46, grass movement was detected on the video. At 05:16:03, a cow's muzzle was visible at the nest (Fig. 2A), where it remained for 5 sec, but the cow did not remove any of the nestlings (Fig. 2B, 05:16:21). At 05:16:45, a cow's muzzle passed over the nestlings again for 3 sec without removing anything. At 05:16:53, a cow's muzzle was visible at the nest for a third time for 13 sec, during which time the cow pulled its muzzle out of the nest bowl with at least one nestling in its mouth (presumably two nestlings; Fig. 2C, 05:17:01). The cow then dropped one nestling back into the nest bowl (Fig. 2D, 05:17:02) and moved out of camera view. Two nestlings remained in the nest bowl (Fig. 2E, 05:17:26). At 05:17:30, a cow's muzzle was again visible at the nest bowl and remained there for 5 sec, during which time it removed both of the remaining nestlings (Fig. 2F, G). At 05:17:35, the nest bowl was empty (Fig. 2H). In summary, the cow was at the nest for at least 26 sec during four visits. We examined the nest and surrounding area on 7 July at 12:50, and found no sign of the three nestlings; the nest bowl was flattened on one side and the grass surrounding the nest was trampled. The nestlings showed no attempt to fledge during filming and we think it is unlikely that they survived.

DISCUSSION

This study was designed to document the predators of ground-nesting grassland bird nests in continuously grazed pastures in southwestern Wisconsin. The use of cameras allowed us to document—for the first time—apparent nest predation by cattle. Cattle removed eggs and nestlings, then either consumed nest contents that were unaccounted for or simply carried them off. Alternatively, missing nest contents may have been scavenged by other animals or removed from the nest area by the adult birds after the cattle left.

All of our pastures were on private land where stocking rates were at the discretion of the landowner. In the Midwest, a light, continuous grazing regime would be about 1

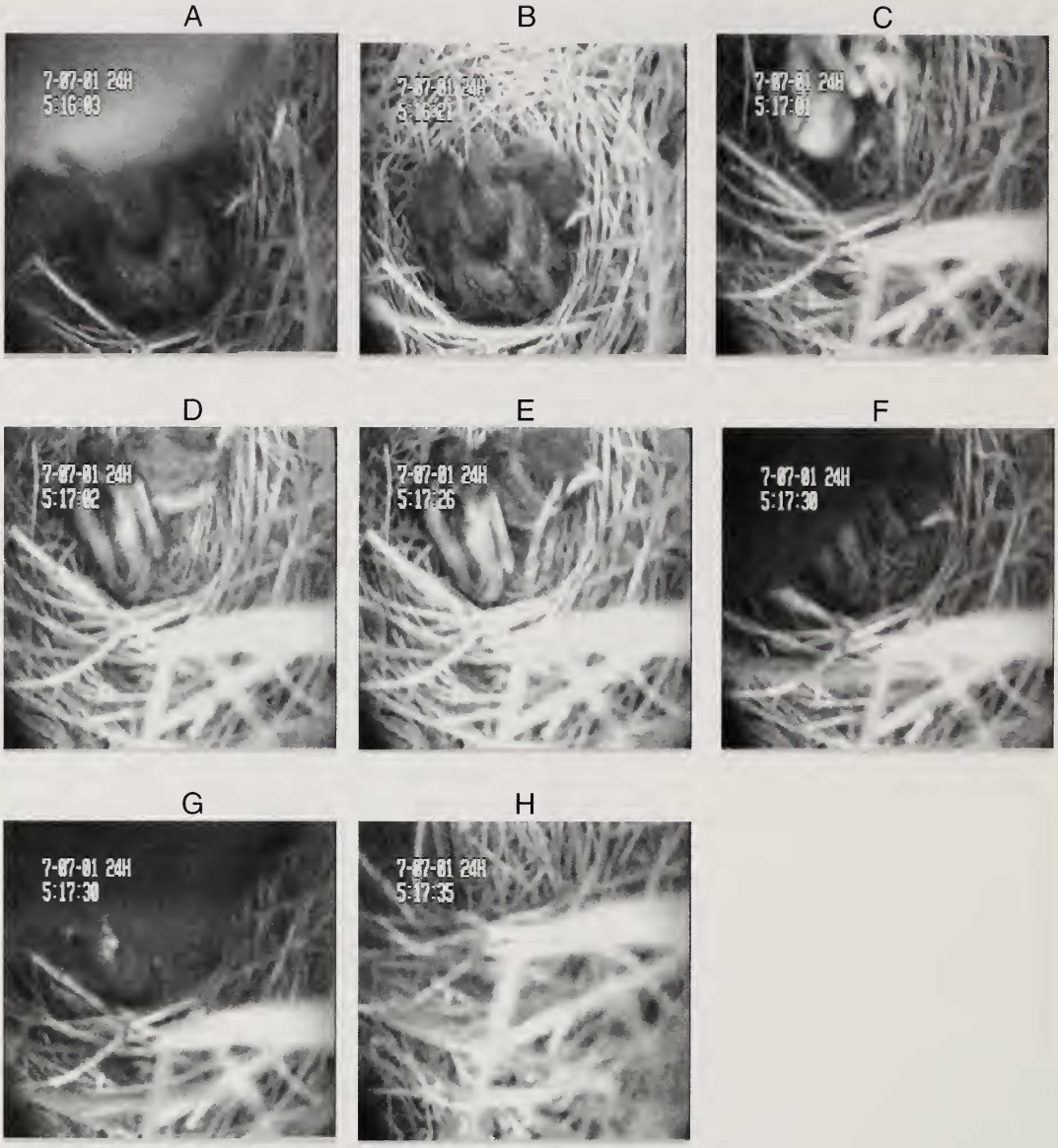

FIG. 2. Sequence of images documenting a cow removing three 7-day-old Savannah Sparrow nestlings from an open-cup nest in a southwestern Wisconsin pasture, 7 July 2001.

AU/ha, and a moderate, continuous grazing regime would be about 2 AU/ha under average environmental conditions (D. J. Undersander pers. comm.). Stocking rates in the pastures we studied appeared to be moderate. Although camera equipment in the pastures may have contributed to cattle disturbance of nests, we do not believe that stocking rates per se influenced cattle disturbance to the cameras or the nests. Instead, cattle-caused nest failure appeared to be associated more with the behavior of individual herds rather than stocking rates (Nack 2002). Our observations suggest that curiosity and behavior of cattle toward the camera and VCR system varied among herds. The range of behavior we observed was similar to that described by Renfrew and Ribic (2003) in southwestern Wisconsin. In some pastures, cattle were uninterested in camera equipment; they only investigated it initially

and then ignored it. In a few pastures, cattle frequently knocked over the cameras, but did not necessarily cause nests to fail.

Whether or not cattle found nests as a result of their attraction to the cameras, we documented that once a cow discovers a nest, it does not necessarily ignore it. Similar events likely occur when cattle incidentally discover nests while grazing, much like any other predator that forages opportunistically. Based on the evidence (or lack thereof), we would have assigned nest fate correctly as predation, but would not have considered cattle as possible predators. Videotaped evidence of cattle removing nestlings and eggs from ground nests suggests that the impact of cattle on grassland bird nests has been underestimated in the past.

Future studies should be conducted to quantify the extent to which cattle disturb nests while minimizing their attraction to camera equipment. To reduce curiosity and habituate cattle to camera equipment, Renfrew and Ribic (2003) suggest deploying "fake" camera systems 2 to 3 weeks prior to use.

Conducting research on ground-nesting grassland birds in actively grazed pastures is challenging. Future advances in camera technology may benefit researchers. For example, cameras that can be placed in close proximity to nests while providing a wider field of view would help with identifying larger predators and determining the fate of each egg and/or nestling. Wireless camera systems (e.g., King et al. 2001) designed to operate from outside of the pasture fencing would eliminate the need to have the VCR, battery, and protective pyramid, which seem to attract the cattle. This would also reduce set-up time, as there would be no need to bury video cable.

ACKNOWLEDGMENTS

We thank P. J. Pietz, D. W. Sample, L. Paine, M. J. Guzy, and S. M. Vos for providing helpful comments on an earlier version of this manuscript. We also thank M. J. Guzy for reviewing videotapes and helping to capture figure images. P. J. Pietz and two anonymous referees provided thoughtful reviews of this manuscript. Funding for this project was provided by the Department of Wildlife Ecology at the University of Wisconsin-Madison, USGS Wisconsin Cooperative Wildlife Research Unit, Wisconsin Department of Natural Resources, USFWS Partnerships for Wildlife, and the USDA Cooperative State Research, Education, and Extension Service. We thank the Max McGraw Wildlife Foundation for assistance with publication expenses. Mention of a company or trade name does not constitute endorsement of a product.

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